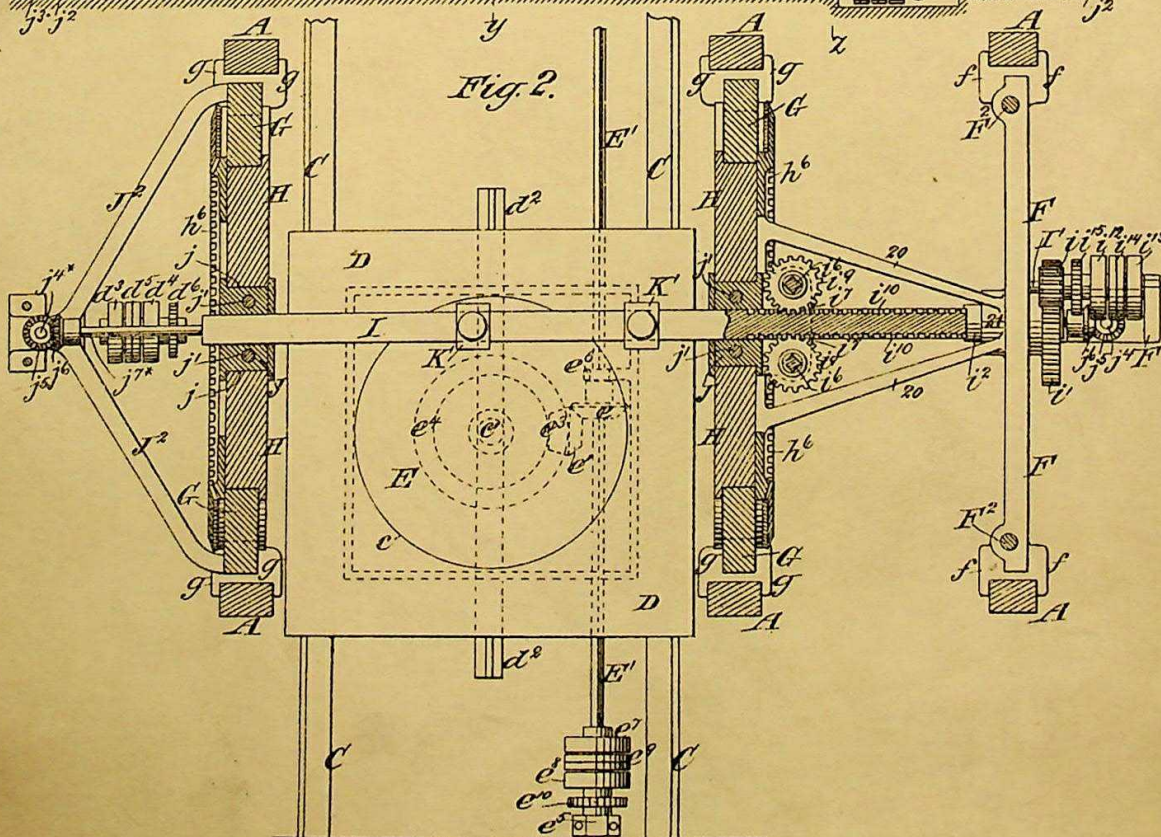
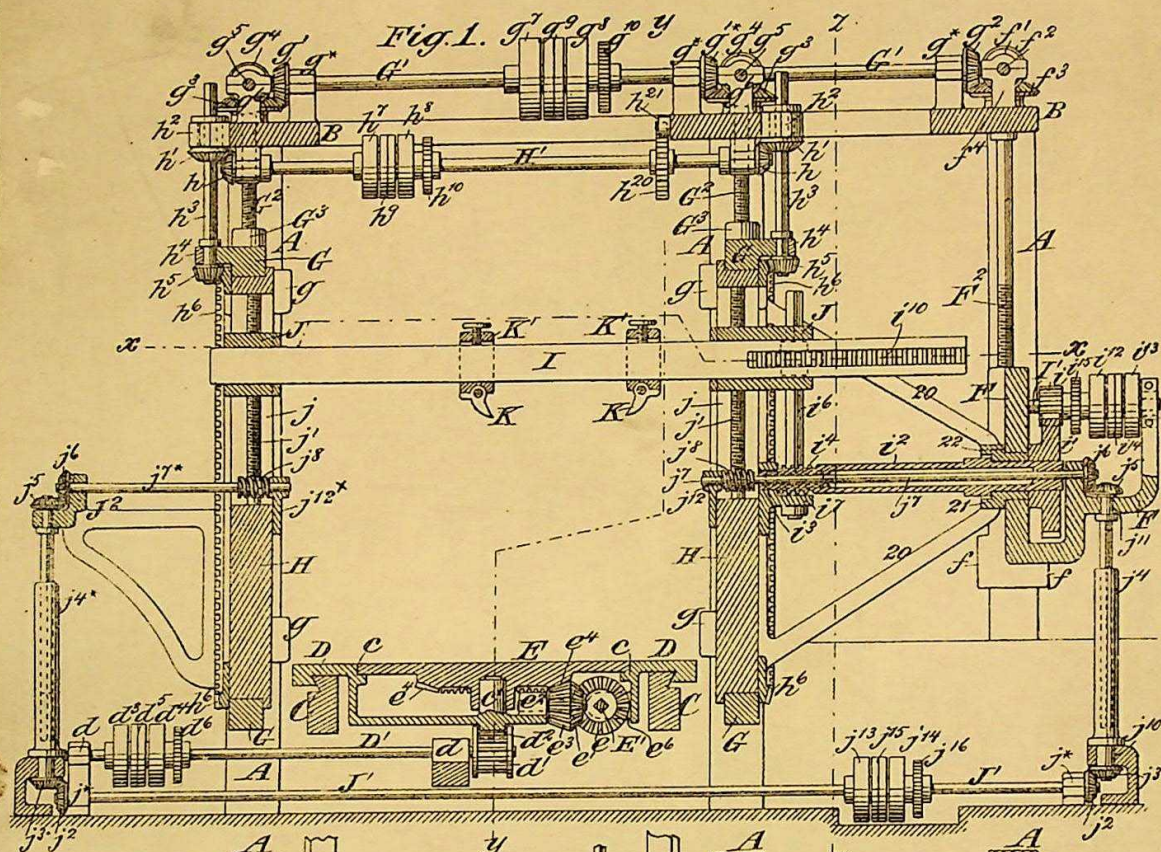


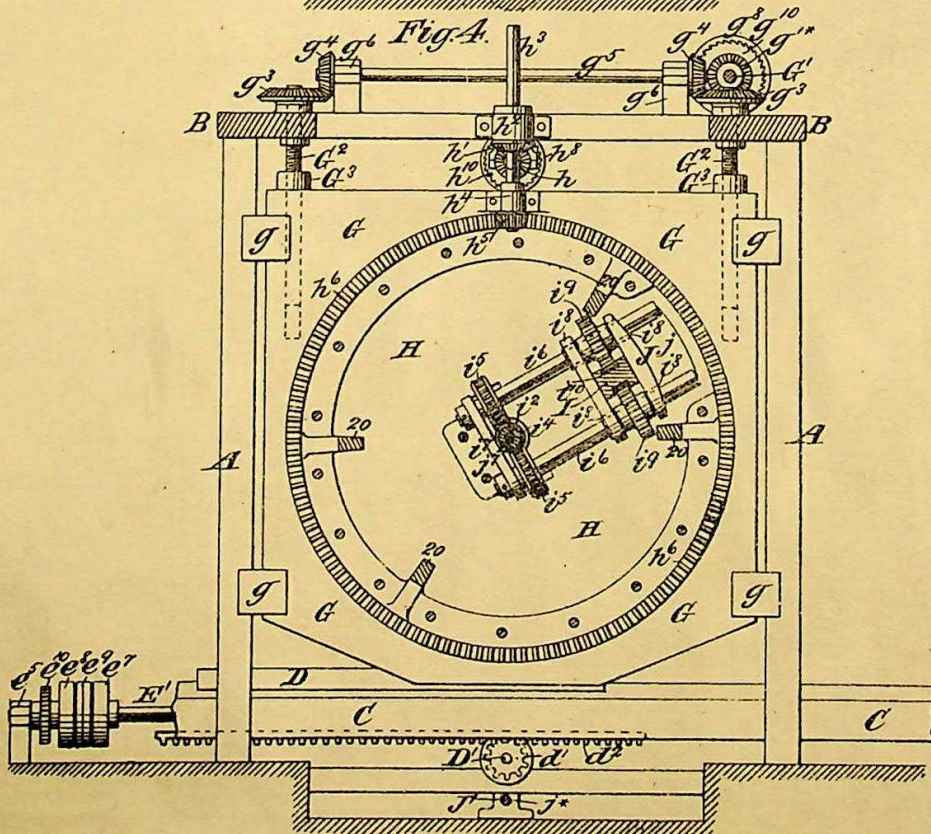
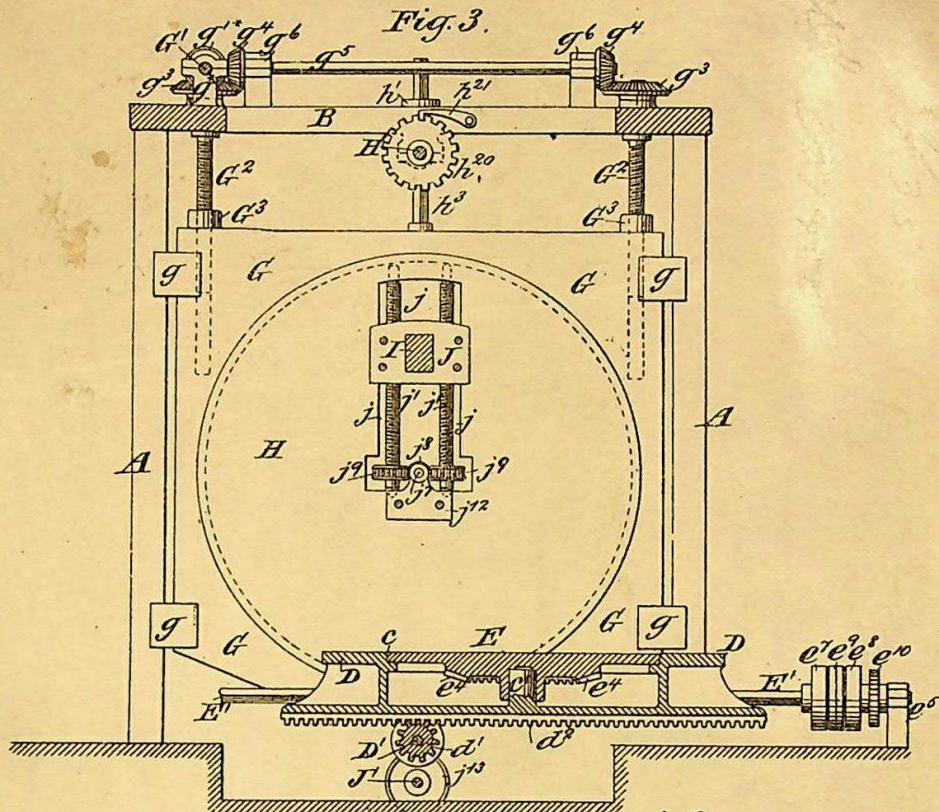
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A.D. 1889. FEB. 5. N^o 2049.
YOUNG'S COMPLETE SPECIFICATION.

SHEET 1.





A.D. 1889. FEB. 5. N° 2049.
YOUNG'S COMPLETE SPECIFICATION.

SHEET 3.

Fig. 5.

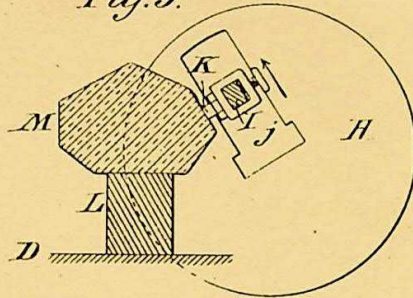


Fig. 6.

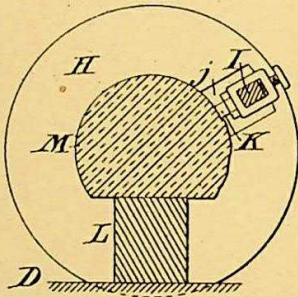


Fig. 7.

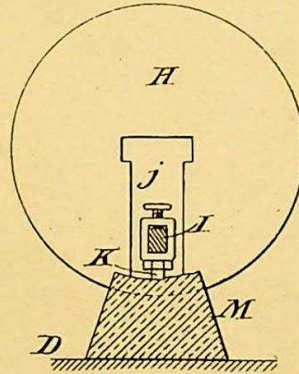


Fig. 8.

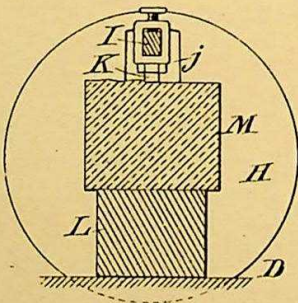


Fig. 9.

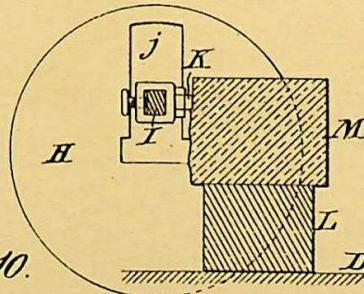
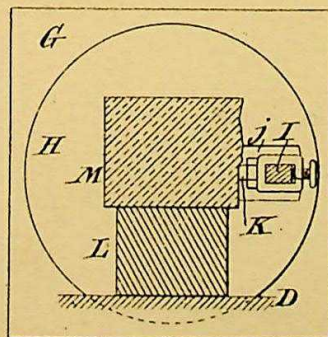


Fig. 10.



Young 2049 Feb. 5, 1889

(4 SHEETS)
SHEET 4.

6. Dressing Stone

[This Drawing is a full-size reproduction of the Original.]

Fig. 11.

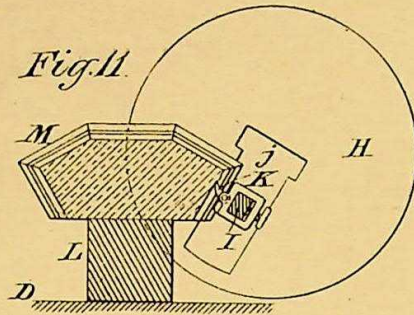


Fig. 12.

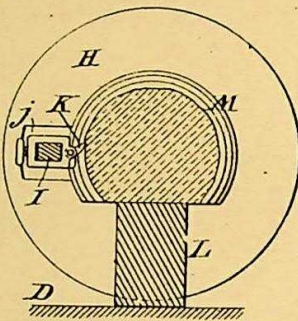


Fig. 13.

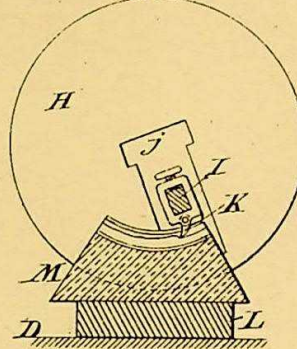


Fig. 14.

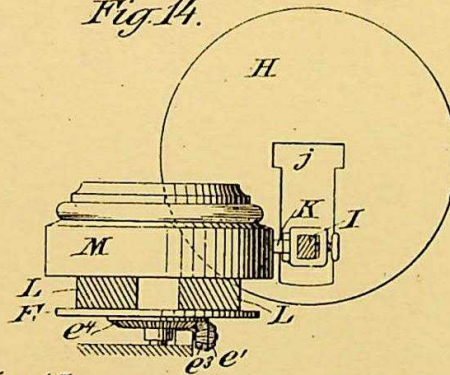
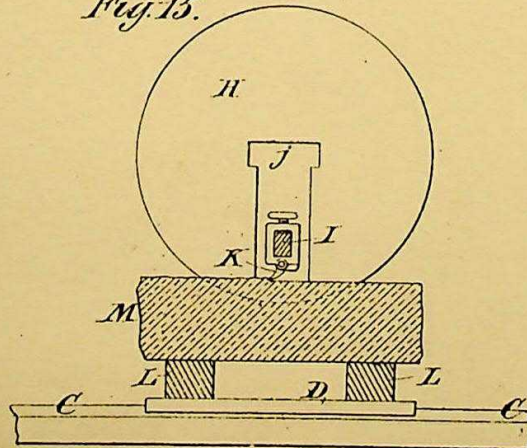


Fig. 15.



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125. STONE WORKING.
6. Dressing Stone.

Date of Application, 5th Feb., 1889
Specification Accepted, 16th Mar., 1889

See U. S. 397, 410

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A.D. 1889, 5th FEBRUARY. N° 2049.  
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COMPLETE SPECIFICATION.

Improvements in Machines for Cutting Stone and other Substances.

I HUGH YOUNG of 138th Street and 4th Avenue in the City and State of New York, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

- 5 The object of my invention is to provide in one machine for the cutting of stone or other substances into different forms having flat, polygonal, or curved surfaces; and a machine embodying my invention is composed of certain distinct and specific parts movable in certain distinct and specific lines by mechanism adapted to the production of said movements of said parts; each of said distinct and specific parts, and the
- 10 mechanism for producing its distinct and specific movements, constituting a distinct member of said machine, all of said distinct members, and the movements, thereof being so arranged in relation to each other, that any one of said members may, according to its fitness for the work required, be used as the primary or operative member of the machine for the time being; during which primacy of said member, all
- 15 the other members of the machine, whether stationary or in continuous or intermittent motion, become auxiliary for support, adjustment, or feed, the aim of this interchangeability of relation between the several members and movements thereof being to obtain a maximum of geometric range and combinations from a minimum of parts and movements.
- 20 I will proceed to describe a machine embodying my invention, and will afterwards point out by claims the novelty of the invention.
- In the machine selected to illustrate my invention, there are six distinct members, each of which has its own distinctive line of movement.
- Member No. 1 has for its distinctive part a horizontal bed or table, and includes the
- 25 mechanism for moving said bed or table horizontally in the line of its own length.

[Price 11d.]

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Young's Improvements in Machines for Cutting Stone and other Substances.

Member No. 2 has for its distinctive part a rotary table, preferably mounted on the horizontal table, and includes the mechanism for imparting to it its rotary motion.

Member No. 3 has for its distinctive part a cutter bar, and includes the mechanism for imparting to it, movement in the line of its own length.

Member No. 4, has for its distinctive part vertical frames or gates, and includes the mechanism for imparting to them vertical motion. 5

Member No. 5 has for its distinctive part a rotary cutter-bar carrier mounted and rotating on the vertically moving gates, and includes the mechanism for imparting a rotary movement to said cutter-bar-carrier; and

Member No. 6 has for its distinctive part boxes radially mounted on the cutter-bar-carrier, in which the cutter-bar slides in the line of its own length, and includes the mechanism for imparting a radial movement to said boxes in their relation to the axis of the cutter-bar-carrier. 10

In the accompanying drawings,

Fig. 1 represents a central vertical section of the machine. 15

Fig. 2 represents a horizontal section in the line $x x$, Fig. 1.

Fig. 3 is a transverse vertical section in the line $y y$, Fig. 1, looking from the left.

Fig. 4 is a vertical section in the line $z z$, Fig. 1, looking from the right.

Figs. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14 and 15, are diagrams illustrating the operations performed by the machine. 20

Similar letters of reference designate corresponding parts in all the Figures.

A, B, C designate the stationary framing of the machine, represented as consisting of upright posts A, an entablature B mounted thereon, and horizontal ways C C. D designates a horizontal bed fitted to slide on the ways C, and having fitted to a circular recess c , and pivot c^1 , a circular rotary table E. 25

Between the posts A, on opposite sides of the ways C and bed D, are two upright sliding frames or gates G, the faces of which are parallel with the ways C C, the said gates being fitted to the posts with gibs g .—Within each of these upright sliding gates G, is one of two rotary discs H, which combine to form what I will hereinafter term the cutter-bar-carrier.—Said cutter-bar-carrier carries the cutter-bar I by means of two sliding boxes J, which are fitted to slide radially in the discs H in parallel-sided openings j provided in the said discs, the said boxes being movable towards and from the centre of the discs. 30

The sliding bed D, the rotary table E, the cutter bar I, the vertically sliding gates G, the rotary cutter bar carrier H H, and the radially moving boxes J J, are severally provided with separate driving shafts for producing their respective movements. 35

D^1 (Fig. 1) designates the driving shaft for the reciprocating bed D working in bearings at d , and furnished with a toothed pinion d^1 gearing with a straight rack d^2 on the bottom of the bed D. The said shaft D^1 is represented as furnished with tight and loose pulleys $d^3 d^4 d^5$, for open and crossed belts, to provide for turning the shaft in both directions, and producing the horizontal movement of the bed D on the slides C in either direction.—The said shaft D^1 is also represented as furnished with a ratchet wheel d^6 , through which motion may be communicated to it by a pawl deriving motion in any suitable manner. 40

E^1 designates the driving shaft for producing the rotary motion of the table E within the bed D, the said shaft working in a fixed bearing e^6 , as shown in Fig. 2, and being provided with a bevel gear e gearing with a bevel gear e^1 which turns loosely on a fixed stud secured, as shown at e^2 in Fig. 1, in the sliding bed D.—The said bevel gear e^1 has secured to it another bevel gear e^3 , which gears with a bevel gear e^4 which is secured to or integral with the bottom of the table E. The bevel gear e being required to move with the table E in the movement of the latter with the bed, is arranged to slide upon the shaft E^1 , but compelled to rotate with it by being fitted to said shaft with a square or spline, and it has a bearing e^6 of its own, in which it rotates, provided for it on the frame D. Said shaft E^1 is represented as also furnished with tight and loose pulleys $e^7 e^8$ and e^9 , for open and crossed belts, for driving it in either 45 50 55

Young's Improvements in Machines for Cutting Stone and other Substances.

direction, and also represented as furnished with a ratchet wheel e^{10} , through which it may be turned by a pawl actuated in any suitable manner.

- G^1 designates the driving shaft by which the upward and downward vertical movement of the upright sliding gates G is produced, working in bearings g^* on the entablature B of the framing.—This shaft is furnished with three bevel gears g^1 , g^{1*} and g^2 , forming part of a train of bevel gearing for turning the upright screws G^2 , by which the upward and downward movement of the gates G is produced.—These screws, two for each gate G , are free to turn, but confined longitudinally in bearings in the entablature B , and screw into nuts G^3 fixedly secured upon the said gates G .
 5 Each of the said screws is furnished with a bevel gear g^3 , these being all of equal size, the gears g^1 and g^{1*} , which are of equal size, gearing directly with those g^3 on two of the screws G^2 , namely, one screw of each gate. The gears g^3 of the two screws of each gate are geared together by bevel gears g^4 , of equal size, on shafts g^5 , one for each gate, arranged at right angles to the shaft G^1 in bearings g^6 on the entablature B .
 10 By the system of gearing above described, the rotary motion of the shaft G^1 produces precisely corresponding movements of the gates G , whose positions therefore always correspond.—The shaft G^1 is represented as furnished with tight and loose pulleys g^7 , g^8 and g^9 , to receive open and crossed belts for driving it in different directions. The said shaft is also represented as furnished with a ratchet wheel g^{10} , through which it may be turned by a suitably actuated pawl.

- H^1 designates the driving shaft for producing the rotary movement of the cutter-bar carrier H within the gates G . This shaft is furnished at its ends with two bevel gears h , of equal size, gearing with two bevel gears h^1 , the hubs of which are journalled into bearings h^2 . These bevel gears h^1 have fitted to them, with
 25 squares or splines, upright shafts h^3 , which are journalled into bearings at h^4 on the upper parts of the sliding gates G , and they are furnished at their lower ends with bevel gears h^5 , of equal size, gearing with large bevel gears h^6 , which are bolted to the outer faces of the cutter bar carrier discs H .

- The shafts h^3 , receiving rotary motion through the bevel gears h h^1 , are free to slide lengthwise through the gears h^1 while they move up and down with the gates and the contained cutter-bar-carrier discs, so that no matter what the position of the gates may be, the rotary cutter bar carrier is always in gear with its driving shaft.

- The shaft H^1 is represented as furnished with tight and loose pulleys h^7 , h^8 and h^9 , for the reception of open and crossed belts for driving the shaft in either direction.
 35 It is also represented as furnished with a ratchet wheel h^{10} , through which it may receive motion from a suitably actuated pawl.

- In order to provide for locking the cutter-bar-carrier H in any position to which it may be turned, and so enable it to resist the pressure which in some sorts of work may be brought on the cutter bar in a direction circumferential with, or tangential to the said carrier, I have provided on the shaft H^1 a locking wheel h^{20} to be engaged by a hooked dog h^{21} hung on the entablature B , as shown in Figs. 1 and 3.

- I^1 is the horizontal driving shaft for producing the longitudinal reciprocating movement of the cutter bar I within and through the boxes J J hereinafter described. This shaft is fitted to bearings in a vertically sliding cross-head F , which is fitted
 45 by means of gibs f to two of the upright posts A of the main framing of the machine. Within this cross-head, near the ends thereof, are provided nuts or female screw threads, through which screw two upright screws F^2 , the threads of which correspond with the threads of the screws G^2 , hereinabove described, for the purpose of producing the upward and downward movement of the sliding gates G . These
 50 screws F^2 are supported in bearings in the entablature B , in such manner as to allow them to turn freely, but confine them lengthwise, and they are provided, at their upper ends, with bevel gears f^3 , which are of the same size as the bevel gears g^3 on the screws G^2 . The bevel gear f^3 , on one of these screws, gears as shown in Fig. 1, with the bevel gear g^2 on the right hand end of the shaft G^1 before described, and the two bevel gears f^3 on the two screws are geared together by two bevel
 55 gears f^1 on a horizontal shaft f^2 , working in bearings f^4 on the entablature. The bevel gears g^1 , g^{1*} and g^2 , being all of the same size, and the bevel gears g^4 and f^1 .

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being of the same size, and the bevel gears g^3 and f^3 being of the same size, the screws F^2 have always precisely the same movements as the screws G^2 , so that the movement of the cross-head F always corresponds exactly with that of the two sliding gates G , and in fact, the two sliding gates G and the cross head F may be considered as practically parts of one vertically sliding reciprocating carriage, within which the cutter-bar carrier rotates in planes parallel with the reciprocating movements of the said carriage, the said reciprocating and rotating movements being in planes perpendicular to the planes of the movements of the bed D and the table E .

One of the discs H of the rotary cutter-bar carrier, namely, the one shown at the right of Figs. 1 and 2, has connected with it, by diagonal braces 20, a hollow journal 21, which is concentric with the said disc, and which turns in a bearing at 22 in the crosshead F . These diagonal braces and this journal assist in establishing a firmer base to that one of the discs H of the cutter-bar carrier to which is attached the mechanism for producing the motion of the cutter bar in the line of its own length.

The driving shaft I^1 , for producing the reciprocating longitudinal movement of the cutter-bar, is fitted to bearings in the cross head F , and is furnished with a small spur gear i , which gears with a larger spur gear i^1 on a horizontal shaft i^2 , which works in bearings within the centre of the hollow journal 21, as shown in Fig. 1, and in a journal box i^3 provided on the adjacent disc H of the rotary cutter bar carrier. On this shaft i^2 is provided an endless screw i^4 , which gears with two worm-gears i^5 upon two parallel shafts i^6 , which are journalled in bearings i^7 firmly secured to the adjacent disc H . On these shafts i^6 are provided sleeve spur pinions i^9 , journalled upon the sliding bar J , and which gear with toothed racks i^{10} recessed in opposite sides of the cutter bar L .

By means of the shaft I^1 , spur gears i i^1 , shaft i^2 , endless screw i^4 , worm gears i^5 , shafts i^6 , pinions i^9 , and racks i^{10} , a longitudinal movement is given to the cutter bar in either direction, according to the direction of the revolution of the driving shaft I^1 . In order that this movement of the cutter bar may be produced at whatever distance the said bar may be from the centre of its rotary carrier, the pinions i^9 are so fitted within the boxes J , that they will move towards and from the centre with the said boxes, and they are fitted to their shafts i^6 with splines or squares, so that they may slide longitudinally on the said shafts, while compelled to turn therewith.

The shaft I^1 is furnished with fast and loose pulleys i^{12} , i^{13} , and i^{14} , for the reception of open and crossed belts for driving it in either direction. The said shaft is also represented as furnished with a ratchet wheel i^{15} , through which it may receive motion from a suitably actuated pawl.

J^1 is a horizontal driving shaft for producing the movement of the boxes J and the cutter bar L , fitted thereto, towards and from the centre of the cutter bar carrier. The said shaft J^1 works, as shown in Fig. 1, in stationary bearings j^* , and is furnished at its ends with two bevel gears j^2 , which gear with bevel gears j^3 on the lower ends of two upright shafts j^4 j^{4*} , on the upper ends of which are bevel gears j^5 , which gear with bevel gears j^6 on two horizontal shafts j^7 j^{7*} , on which are endless screws j^8 which gear with worm wheels j^9 provided on the screws j^1 hereinbefore described, which work in nuts in the boxes J . The upright shaft j^4 at the right hand end of the machine (see Fig. 1) has its lower journal fitted to a fixed bearing j^{10} , and its upper journal fitted to a bearing at j^{11} in the cross head F . The corresponding shaft j^7 , at the right hand end of the machine (see Fig. 1), passes through the shaft i^2 , which is bored to receive it. The said shaft j^7 is journalled, near its outer end, in a bearing in the cross-head F , and is journalled at its inner end in a bearing j^{12} , secured concentrically to the adjacent rotary disc H of the cutter-bar-carrier. The upright shaft j^{4*} , and the horizontal shaft j^{7*} , at the left hand end of the machine (see Figure 1), are journalled in bearings in a bracket J^2 , which is secured to the adjacent sliding gate G , and the horizontal shaft j^{7*} is journalled, at its opposite end, in a bearing j^{12*} secured concentrically to the adjacent rotary disc H of the cutter-bar-carrier.

By the system of gearing hereinabove described, between the shaft J^1 and the

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endless screws j^8 , the rotary motion of the said shaft is caused to produce the rotary motion of the said screws, and thereby to move the boxes J and the cutter-bar I towards or from the centre of the cutter-bar carrier H H, according to the direction in which rotary motion is given to said shaft. In order that this rotary motion may
 5 be produced without regard to the height of the vertically sliding carriage G H F, the shafts $j^4 j^{1*}$, are made telescopic, so that they may be elongated and shortened as the said sliding carriage ascends and descends, the upper and lower telescopic members being fitted together with splines or squares. The shaft J¹ is represented as furnished with pulleys j^{13} , j^{14} and j^{15} , to receive open and crossed belts for driving the said shaft
 10 in either direction. The said shaft is also represented as furnished with a ratchet wheel j^{16} , to be operated by a suitably actuated pawl.

It will be observed that each of the driving shafts D¹, E¹, G¹, H¹, I¹, and J¹, for producing the movements of the different members of the machine, is furnished with pulleys for the reception of open and crossed belts for the purpose of producing the
 15 rotation of the said shafts in one direction or the other, and so producing the movement of the members of the machine which they actuate in one direction or the other. It will be also observed that each of the said shafts is furnished with a ratchet wheel, the latter wheel being for the purpose of providing for giving to the said shaft a slow rotary motion. Each of the movements produced by the several
 20 shafts D¹, E¹, G¹, H¹, I¹, J¹, is capable of producing either the operative movement of the work, or of the cutter necessary for cutting, or the movement thereof necessary for feeding and adjusting the work to the cutter, or the cutter to its work.

The cutter-bar I, which is not in itself a tool, is furnished with cutters K, which may be of any suitable kind, the said cutters being held in adjustable stocks K¹ of
 25 any suitable construction. The said stocks should be so applied to the cutter-bar I, that they may be adjustable lengthwise thereof, and that the points or cutting edges of the cutters may be presented upward, downward, laterally, or transversely, in any direction suitable to the work, relatively to the said bar. The section of said bar, and the interior of the stock, are represented as of rectangular section, but may be round,
 30 or of any other section or shape desired.

It may be here mentioned that the cutter-bar does not itself rotate, but revolves laterally around the axis of the rotary carrier in which it is mounted.

Having described the construction of the machine in detail, I will describe a few of its operations in different kinds of work performed by it.

35 The stone to be operated upon is always supported by the bed D, either directly or through the intervention of the rotary table E, suitable blocks L of wood or other material being placed between the stone and the table or bed, if necessary, as shown in Figures 5 to 15 of the drawings.

In all the examples of the operation of the machine, shown in Figures 5 to 10
 40 inclusive, the cutter-bar is operatively movable in the direction of its own length, and the work is done by the movement of the said bar and its cutter or cutters in that direction. In the example illustrated in Figure 5, which represents the cutting of an irregular polygonal prism by the longitudinal movement of the cutter-bar and cutter, with the cutter set in a direction lateral to the said bar, the bed D and the block of stone
 45 M supported thereon are stationary, and the feeding is performed by the movement of the cutter-bar and cutter in a radial direction within the cutter-bar-carrier, as indicated by an arrow in the Figure, the relative position of the tool to the work having been previously established by the horizontal movement of the bed, the vertical motion of the gates, and the rotary motion of the cutter-bar-carrier.—In the example
 50 illustrated in Figure 6, which represents the cutting of a partly circular column by the longitudinal movement of the cutter-bar and cutter, the bed D, and the work M thereon are stationary, and the cutter, which is set on the inner side of the cutter bar I, is fed to its work by the lateral revolving movement of the said cutter-bar and cutter, produced by the rotating movement of the cutter-bar-carrier H H on its axis,
 55 the proper radial position of the cutter-bar having been first established, and the stone M having been also arranged concentric to the axis of the cutter-bar-carrier by the horizontally moving table and vertically moving frame. In the example represented

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in Figure 7, which represents the cutting of the inner arc of a voussoir, the cutter is set on the outer side of the cutter-bar, the bed D and the stone M are stationary, and the cutter-bar, besides having a longitudinal operative movement by which the cutting is produced has a lateral revolving feeding movement given to it by the circular motion of the cutter-bar-carrier H H,—the relative position of the tool to the work 5 having been previously established by the radial movement of the bar,—the vertical movement of the gates, and the horizontal movement of the table.

In the example illustrated in Figure 8, which represents a simple horizontal planing operation by the lengthwise operative movement of the bar, the cutter is set on the inner side of the bar, and the block of stone M is fed to the cutter by the movement 10 of the bed D on the ways O, the cutter-bar-carrier H being stationary, the relative position of the tool to the work having been previously established by the vertical movement of the gates, the rotary movement of the cutter-bar-carrier and the radial movement of the bar.—In the example shewn in Figure 9, which illustrates the planing of a vertical flat surface, the planing is also done by the longitudinal 15 operative movement of the cutter-bar. The bed D and the stone M are stationary, and so is the cutter-bar-carrier H, and the feeding is produced by the downward vertically radial movement of the cutter-bar in the carrier H, the relative position of the tool to the work having been previously established by the horizontal movement of the table, the vertical movement of the gates, and the rotary movement of the 20 cutter-bar-carrier. In the example shewn in Figure 10, which also illustrates the planing of a vertical flat surface, by the same operative movement of the cutter-bar and cutter, the bed D and the stone M are stationary, the cutter is set on the inner side of the cutter-bar I, the cutter-bar-carrier H is stationary within the upright sliding gates G, and the feeding of the cutter to the work is produced by the move- 25 ment of the gates G, the relative position of the tool to the work having been previously established by the horizontal movement of the table, the rotary movement of the cutter-bar-carrier, and the radial motion of the bar.

In the examples shewn in Figures 11, 12, 13, 14, 15, the longitudinal movement of the cutter-bar is not the operative or primary movement by which the cutting is 30 effected, but becomes subordinate, for the purposes of adjustment or feed.—In Figure 11, which illustrates the transverse cutting of one of the sides of an irregular prism, the bed D and the stone M are stationary, the cutter is set on one side of the bar; the operative movement for cutting is the upward radial movement of the cutter bar I, and the feeding of the cutter to the work is produced by the longitudinal movement of the 35 cutter-bar, while the carrier H is stationary,—the relative position of the tool to the work having been previously established by the horizontal movement of the bar, the vertical movement of the gates, and the rotary movement of the cutter-bar-carrier.—In the example shewn in Figure 12 which illustrates the transverse cutting of a partly circular 40 body, the cutter is set on the inner side of the cutter-bar; the operative movement for cutting is the laterally revolving movement of the cutter bar, produced by the rotary movement of the cutter-bar-carrier H, and the feeding of the cutter to the work is produced by the longitudinal movement of the cutter-bar, the bed D and the stone M being stationary, the relative position of the tool to the work having been previously 45 established by the horizontal movement of the table, the vertical movement of the gate, and the radial movement of the cutter-bar. In the example shewn in Figure 13, which illustrates the cutting of the inner arc of a moulded voussoir, the cutter is set on the outer side of the bar, the operative movement for cutting is the laterally revolving movement of the cutter-bar produced by the rotary movement of the carrier H, and the feeding of the cutter to the stone is produced by the longitudinal movement 50 of the bar, the bed D and the stone M being in this case stationary, the relative position of the tool to the work having been previously established by the same means as in No. 12. In the example shewn in Figure 14, which represents the cutting of the plinth of a circular column, the operative movement for cutting is the rotary movement of the table E, and the cutter, which is set laterally to the bar, is fed to 55 the stone by the radial movement of the bar within the carrier H, the bed and the

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carrier being stationary, the relative position of the tool to the work having been previously established by the lengthwise movement of the bar, the horizontal movement of the table, the rotary movement of the cutter-bar-carrier, and the vertical movement of the gates. In the example shewn in Figure 15, which illustrates the
 5 horizontal planing of the upper side of a slab, the operative movement for the cutting is the horizontal movement of the bed D on the ways C, and the feeding of the cutter to the work is produced by the longitudinal movement of the cutter-bar, while the carrier H is stationary, and in this case the cutter is set on the outer side of the bar, the relative position of the tool to the work having been previously established
 10 by the vertical movements of the gates, the rotary movement of the cutter-bar-carrier, and the radial movement of the cutter-bar.

The adjustment of the depth of cut may be produced by moving the stone towards the cutter, or the cutter towards the stone,—the movement being effected by slowly turning such one of the several driving shafts as will produce the movement
 15 desired.

Having now particularly described and ascertained the nature of my said Invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. The combination in a machine for cutting stone or other substance, of a
 20 rotary cutter-bar-support, a cutter-bar revolving laterally around the axis of said support, and operatively movable upon said support in a path parallel to said axis, and a tool adjustable upon said bar, substantially as described.

2. The combination, in a machine for cutting stone or other substance, of a rotary cutter-bar-support, a cutter-bar revolving laterally around the axis of said
 25 support, said bar being operatively moveable upon said support, in the line of its own length, and operatively and laterally movable nearer to and farther from the said-axis, and a tool adjustable upon said bar, said tool being set radially to the axis of said support, substantially as herein described.

3. The combination in a machine for cutting stone, or other substance, of a
 30 rotary cutter-bar-support, a cutter-bar operatively revolving laterally around the axis of said support, said bar being also operatively movable upon said support, in the line of its own length, and operatively and laterally movable nearer to or farther from the said axis, and a tool adjustable upon said bar, said tool being set at an angle to a radial line drawn to the axis of said support, substantially as herein described.

35 4. The combination, in a machine for cutting stone or other substance, of a rotary-cutter-bar support, a cutter-bar revolving laterally around the axis of said support, said bar being operatively movable upon said support, in the line of its own length, and operatively and laterally movable nearer to or farther from the said axis, and a tool adjustable upon said bar, said tool being set at an angle to the length line of said
 40 bar, substantially as herein described.

5. The combination, in a machine for cutting stone or other substance, of a rotary cutter-bar-support, a cutter-bar revolving laterally around the axis of said support, said bar being operatively movable upon said support, in the line of its own length, and operatively and laterally movable nearer to or farther from the said axis, and a tool
 45 adjustable upon said bar, said tool being set inward towards the axis of said rotary support, substantially as herein described.

6. The combination, in a machine for cutting stone, or other substance, of a rotary cutter-bar-carrier and a cutter-bar movable within said carrier, in the direction of its own length, in lines parallel to the axis of rotation of said carrier, and a cutter adjust-
 50 able on said cutter-bar, substantially as herein described.

7. The combination, in a machine for cutting stone or other substance, of a rotary cutter-bar-carrier, a frame in which the said carrier is contained, and within which it rotates, and a cutter-bar movable within said carrier in the direction of its own length, in lines parallel to the axis of rotation of said carrier, and a tool adjustable on
 55 said cutter-bar, substantially as described.

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8. The combination, in a machine for cutting stone or other substance, of a horizontally movable bed or table, mechanism for moving the same in the line of its own length, a cutter-bar having a lateral revolving movement, and a movement towards and from the axis of its revolution, mechanism for producing said revolving movement of the cutter-bar, and mechanism for producing the movement of the cutter-bar towards and from the axis of its revolution, the three said mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described. 5

9. The combination, in a machine for cutting stone or other substance, of a horizontally movable bed or table, mechanism for moving the same horizontally in the line of its own length, a cutter-bar having a lateral revolving movement, and also having a lateral vertical movement, mechanism for producing the lateral revolving movement, and mechanism for producing the lateral vertical movement, all the three said mechanisms being so organized that any two may be subordinated while the other maintains a primacy, substantially as described. 10 15

10. The combination, in a machine for cutting stone, or other substance, of a horizontally movable bed or table, mechanism for moving the same horizontally in the line of its own length, a cutter-bar having a lateral revolving movement, and a horizontal movement in the line of its own length and parallel with the axis of its revolution, mechanism for producing the revolving movement of the cutter-bar, and mechanism for moving the cutter-bar in the line of its own length and parallel with the axis of its revolution, all the three mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described. 20

11. The combination, in a machine for cutting stone, or other substance, of a horizontally movable bed or table, mechanism for moving the same horizontally in the line of its own length, a rotary bed or table, mechanism for rotating the rotary table, a cutter-bar and mechanism for laterally revolving said cutter-bar, all the three said mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described. 25 30

12. The combination, in a machine for cutting stone, or other substance, of a horizontally movable bed or table, mechanism for moving the same horizontally in the line of its own length, a cutter-bar having a vertical movement, a lateral revolving movement, and a movement towards and from the centre of its revolution in any direction, mechanism for producing the said vertical movement of the cutter-bar, mechanism for producing the said revolving movement of the cutter bar, and mechanism for producing the movement of the cutter bar towards and from the centre of its revolution, all the said mechanisms being so organized that any three may be subordinated while the other maintains a primacy, substantially as described. 35

13. The combination, in a machine for cutting stone or other substance, of a horizontally movable bed or table, mechanism for moving the same horizontally in the line of its own length, a cutter-bar having a lateral revolving movement, a horizontal movement in the line of its own length, and a movement towards and from the centre of its revolution, mechanism for producing said revolving movement of the cutter-bar, mechanism for producing the movement in the direction of the length of the cutter-bar, and mechanism for producing the movement of the cutter-bar towards and from the centre of its revolution, all the said mechanisms being so organized, that any three may be subordinated while the other maintains a primacy, substantially as described. 40 45

14. The combination, in a machine for cutting stone or other substance, of a horizontally movable bed or table, mechanism for moving the same horizontally in the line of its own length, a rotary table, mechanism for rotating the table, a cutter-bar having a lateral revolving movement and a movement towards and from the centre of its revolution, mechanism for producing said revolving movement of the cutter-bar, and mechanism for producing the movement of the cutter-bar toward and from the centre of its revolution, all the said mechanisms being so organized, that any 55

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three may be subordinated while the other maintains a primacy, substantially as described.

15. The combination, in a machine for cutting stone or other substance, of a horizontally movable bed or table, mechanism for moving the same horizontally in the line of its own length, a cutter-bar having a lateral vertical movement and a movement horizontally in the line of its own length, mechanism for producing the lateral vertical movement of the cutter-bar, and mechanism for producing the movement of the cutter-bar in the line of its own length, all the said three mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described.

16. The combination, in a machine for cutting stone or other substance, of a horizontally movable bed or table, mechanism for moving the same horizontally in the line of its own length, a rotary table, mechanism for imparting a rotary movement to the latter table, a cutter-bar laterally movable in a vertical direction, and mechanism for producing said movement of the cutter-bar, all the said three mechanisms being so organized that any two may be subordinated while the other maintains a primacy, substantially as described.

17. The combination, in a machine for cutting stone or other substance, of a cutter-bar having a lateral revolving movement, a movement towards and from the centre of its revolution, and a vertical movement, mechanism for producing the revolving movement, mechanism for producing the movement towards and from the centre of revolution, and mechanism for producing the vertical movement, all the said three mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described.

18. The combination, in a machine for cutting stone, or other substance, of a cutter-bar having a lateral revolving movement, a movement towards and from the centre of its revolution, and a movement in the direction of its own length and parallel with the axis of its revolution, mechanism for producing the said revolving movement, mechanism for producing the movement towards and from the centre of its revolution, and mechanism for producing a movement of the cutter-bar in the line of its own length, all the said three mechanisms being so organized that any two may be subordinated while the other maintains a primacy, substantially as described.

19. The combination, in a machine for cutting stone, or other substance, of a cutter-bar having a lateral revolving movement and a movement towards and from the centre of its revolution, mechanism for producing the said revolving movement, mechanism for producing the movement towards and from the centre of its revolution, a rotary table, and mechanism for producing the movement of this table, all the said three mechanisms being so organized that any two may be subordinated while the other maintains a primacy, substantially as described.

20. The combination, in a machine for cutting stone or other substance, of a cutter-bar having a lateral revolving movement, a lateral vertical movement, and a movement horizontally in the line of its own length, parallel with the axis of its revolution, mechanism for producing the lateral revolving movement, mechanism for producing the lateral vertical movement, and mechanism for producing said horizontal movement of the cutter-bar in the line of its own length, parallel with the axis of its revolution, all said three mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described.

21. The combination, in a machine for cutting stone, or other substance, of a cutter-bar having a lateral revolving movement and a lateral vertical movement, mechanism for producing the lateral revolving movement, mechanism for producing the lateral vertical movement, a rotary table, and mechanism for rotating the table,—all the said three mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described.

22. The combination, in a machine for cutting stone, or other substance, of a cutter-bar having a lateral revolving movement, and a horizontal movement in the line of its own length, parallel with the axis of its revolution, mechanism for producing

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the lateral revolving movement, mechanism for producing said horizontal movement, a rotary table, and mechanism for rotating the table, all the said three mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described.

23. The combination, in a machine for cutting stone, or other substance, of a cutter-bar having a lateral vertical movement and a movement horizontally in the line of its own length, mechanism for producing the lateral vertical movement, mechanism for producing the horizontal movement, a rotary table, and mechanism for rotating the table, all the said three mechanisms being so organized, that any two may be subordinated while the other maintains a primacy, substantially as described.

24. The combination, in a machine for cutting stone or other substance, of a bed or table for supporting the work, a rotary cutter-bar carrier, a frame in which the said carrier is contained and within which it rotates, and the cutter-bar movable within said carrier in the direction of its own length and parallel with the axis of the rotation of said carrier, and a cutter adjustable on said bar, substantially as described.

25. The combination in a machine for cutting stone, or other substance, of a bed or table for supporting the work, a rotary cutter-bar-carrier, a frame in which the said carrier is contained and within which it rotates, and a cutter-bar laterally movable within the said carrier, towards and from the centre thereof, and a cutter adjustable on said bar, substantially as described.

26. The combination, in a machine for cutting stone, or other substance, of a bed or table for supporting the work, a rotary cutter-bar-carrier, a frame in which the said carrier is contained and within which it rotates, and a cutter-bar movable within said carrier in the direction of its own length, and laterally in a direction radial to the axis of said carrier, and a cutter adjustable laterally on said bar, substantially as and for the purpose herein described.

27. The combination, in a machine for cutting stone or other substance, of a table or bed for supporting the work, a reciprocating carriage, a rotary cutter-bar-carrier fitted to rotate within the said reciprocating carriage, and a laterally revolving cutter-bar fitted to move operatively in the direction of its own length within said rotary carrier, in lines parallel with the axis of said carrier, substantially as described.

28. The combination, in a machine for cutting stone or other substance, of a bed or table for the work, a reciprocating carriage, a rotary cutter-bar-carrier fitted to rotate within the said carriage, and a laterally revolving cutter-bar fitted to move operatively within the said rotary carrier in a direction radial to the axis thereof, and a tool adjustable on said bar, substantially as herein set forth.

29. The combination, in a machine for cutting stone, or other substance, of a bed or table for supporting the work, a reciprocating carriage, a rotary cutter-bar-carrier fitted to rotate within the said carriage, and a laterally revolving cutter-bar fitted to said rotary carrier, to move operatively therein in the direction of its own length, in lines parallel to the axis of said carrier and laterally in a direction radial to said axis, and a tool adjustable on said cutter-bar, substantially as herein set forth.

30. The combination, in a machine for cutting stone, or other substance, of a reciprocating table or bed for carrying the work, a carriage movable in a direction perpendicular to the reciprocating movement of the said bed, and a laterally revolving cutter-bar operatively movable in the direction of its own length and parallel with the axis of its revolution within said carriage, and in a direction towards and from the reciprocating table or bed, and a tool adjustable on said bar, substantially as described.

31. The combination, in a machine for cutting stone, or other substance, of a rotary table for carrying the work, a carriage movable in a direction perpendicular to the plane of rotation of said table, and a laterally revolving cutter-bar operatively movable in the direction of its own length, parallel with the axis of its revolution within said carriage, and a tool adjustable on said bar, substantially as described.

32. The combination, in a machine for cutting stone, or other substance, of a

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reciprocating bed for carrying the work, a carriage movable in a direction perpendicular to the reciprocating movement of the said bed, a rotary cutter-bar-carrier fitted to rotate within said carriage, and a laterally revolving cutter-bar operatively movable in the direction of its own length within said rotary cutter-bar-carrier, substantially as herein set forth.

33. The combination, in a machine for cutting stone, or other substance, of a reciprocating bed for carrying the work, a carriage movable in a direction perpendicular to the movement of the said bed, a rotary cutter-bar-carrier fitted to rotate within said carriage, and a laterally revolving cutter-bar operatively movable within said rotary cutter-bar-carrier, towards and from the centre thereof, substantially as described.

34. The combination, in a machine for cutting stone, or other substance, of a reciprocating bed for carrying the work, a carriage movable in a direction perpendicular to the reciprocating movement of the said bed, a rotary cutter-bar-carrier fitted to rotate within said carriage, and a cutter-bar operatively movable within said rotary carriage, both in the direction of its own length, and in a direction radial to the axis of said rotary carrier, substantially as described.

35. The combination, in a machine for cutting stone, or other substance, of a horizontally moving supporting bed, a table fitted to the said bed to rotate therein, a carriage movable vertically towards and from said bed, and a laterally revolving cutter-bar operatively movable within said carriage in the direction of its own length, substantially as described.

36. The combination, with the reciprocating bed D, and the rotary table E contained therein, of the driving shaft E¹, the bevel gear *e* fitted to slide on, but to turn with the said shaft, and fitted to turn in a bearing *e*⁶, on the said bed, the bevel gears *e*¹ carried by said bed and gearing with that, *e*, on the shaft, the bevel gear, *e*³, secured to that, *e*¹, and the bevel gear *e*⁴ on the bed gearing with that, *e*³, all substantially as herein described, for driving the table, E, in all positions of the bed D, as herein set forth.

37. The combination, with the reciprocating carriage G, G, F, and the rotary cutter-bar-carrier H H, fitted to rotate in said carriage, of the driving shaft, H¹, furnished with bevel gears, *h*, the bevel gears, *h*¹, having fixed bearings, and gearing with *h*, the shafts, *h*³, fitted to, and longitudinally confined in bearings on said reciprocating carriage, and sliding through, but turning said bevel gears *h*¹, and the bevel gears *h*³ on the rotary cutter-bar-carrier, gearing with said bevel gears *h*³, all substantially as herein described, for driving the rotary cutter-bar-carrier in all positions of the vertically moving carriage, as herein set forth.

38. The combination, with the reciprocating carriage G, G, F, the rotary cutter-bar-carrier H H contained therein, the sliding cutter-bar boxes J, movable within the cutter-bar-carrier, to and from the centre thereof, and the cutter-bar I, having a longitudinal movement within said boxes, and the driving shaft I¹ arranged in bearings movable with the said carriage, of the shaft *i*² working in bearings carried by the cutter-bar-carrier H H, geared with said driving shaft I¹, and furnished with an endless screw *i*⁴, the shafts *i*⁶ working in bearings on the cutter-bar-carrier H H, and furnished with worm gears *i*⁵, gearing with the endless screw *i*⁴, and with spur gears *i*⁹, gearing with a rack *i*¹⁰ on the cutter-bar, the said gears *i*⁹ being movable with the cutter-bar-boxes, and capable of sliding on the shafts *i*⁶, all substantially as herein described, for driving the cutter-bar in all its positions relatively to the cutter-bar-carrier H, and in all positions of the said carrier and carriage, as herein set forth.

39. The combination, with the reciprocating carriage G, G, F, the rotary cutter-bar-carrier H H contained therein, the sliding cutter-bar-boxes movable within the said carrier H H, towards and from the centre thereof, and the screws *j*¹ fitted to said carrier H, and boxes J, of the driving shaft J¹, working in fixed bearings, telescopic shafts *j*⁴ *j*^{4*} geared with the said driving shaft by bevel gears *j*² *j*³, and having each a fixed bearing near one end, and a bearing near the other end, and carried by the reciprocating carriage, the shafts *j*⁷ *j*^{7*} geared with said shafts *j*⁴ *j*^{4*}, by bevel gears *j*⁵ *j*⁶, and being furnished with endless screws *j*⁸ gearing with worm gears *j*⁹ on

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the said screws j^1 , all substantially as herein described, for producing the said movement of the boxes J in all positions of the reciprocating carriage and rotary cutter-bar-carrier, as herein set forth.

40. The combination, with the rotary cutter-bar-carrier H H , and the sliding cutter-bar-boxes J and reciprocating bar working therein, of the shaft j^7 and its 5 gearing, for producing the movements of the said boxes, and the shaft i^2 , and its gearing for producing the longitudinal movement of the cutter-bar, both having bearings in and concentric with the said carrier, and the said shaft, j^7 , passing centrally through the shaft i^2 , substantially as herein described.

Dated this 5th day of February 1889.

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NEWTON & SON,
Agents for the Applicant.

LONDON: Printed for Her Majesty's Stationery Office,
By DARLING AND SON, LTD.

1889.

